

Information Technology

Virtual Construction
in a visually sophisticated enterprise

New Design Paradigms Workshop
Jet Propulsion Laboratory

June 25, 2002

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Imagineering R&D

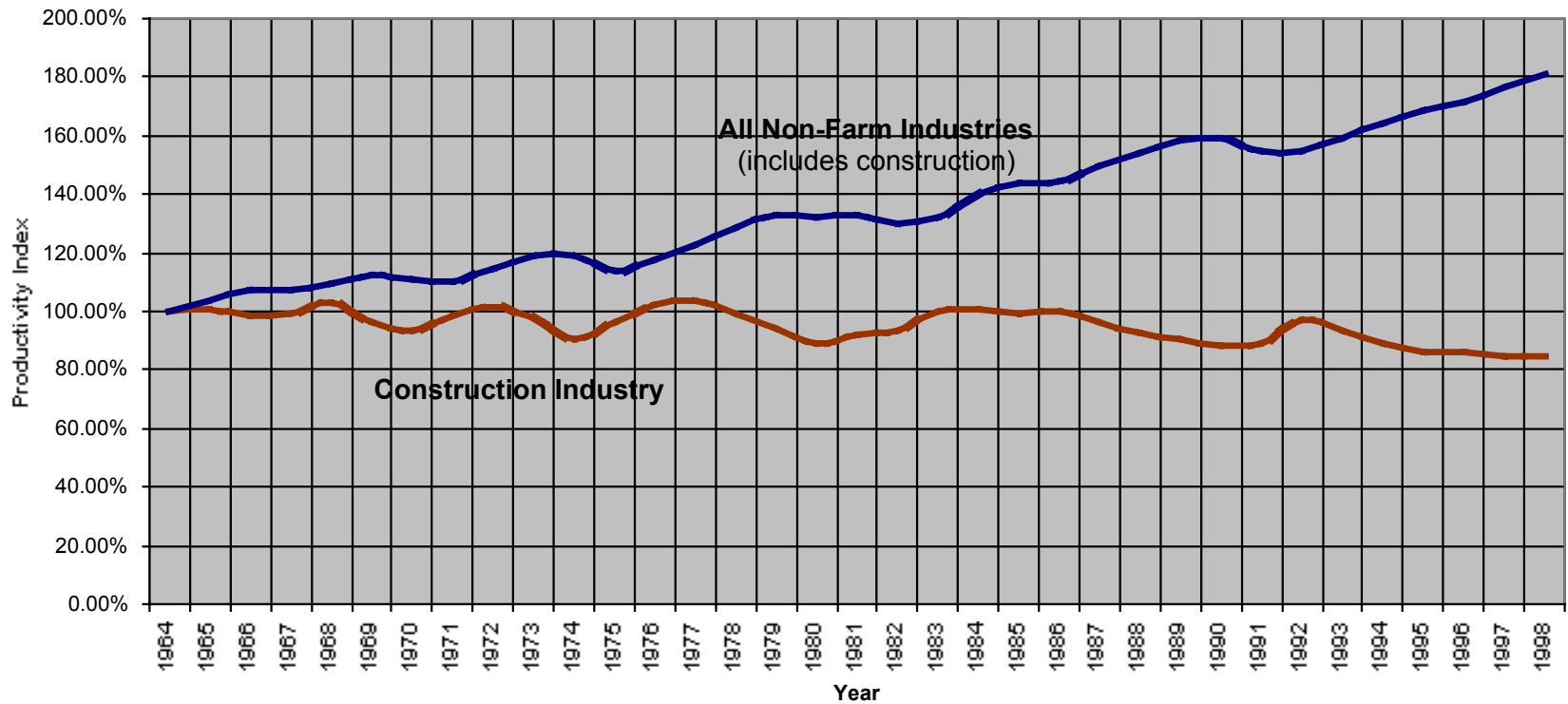


Industry Vision: the big picture

Productivity Index (1964-1998)

(Constant \$ of contracts / workhours of hourly workers)

sources: US Bureau of Labor Statistics, US Dept. of Commerce



Construction Industry All Non-Farm Industries

Productivity: the REAL Issue



Imagineering R&D



Major Themes...

- Mechanics of information exchange
 - formats, schemas, protocols, standards
- Value of information
 - when it is used for some economic purpose





Creating Value with Information

Two limits of value:

- When information is representative of something else “real”
 - math models, designs, photograph
- When the information is the product itself
 - movies, music recordings





Creating Value with Information

The gray zone:

- Simulations
- Interpretations of data





The visually sophisticated enterprise?

Artists, designers, architects, engineers

A culture of “creativity”

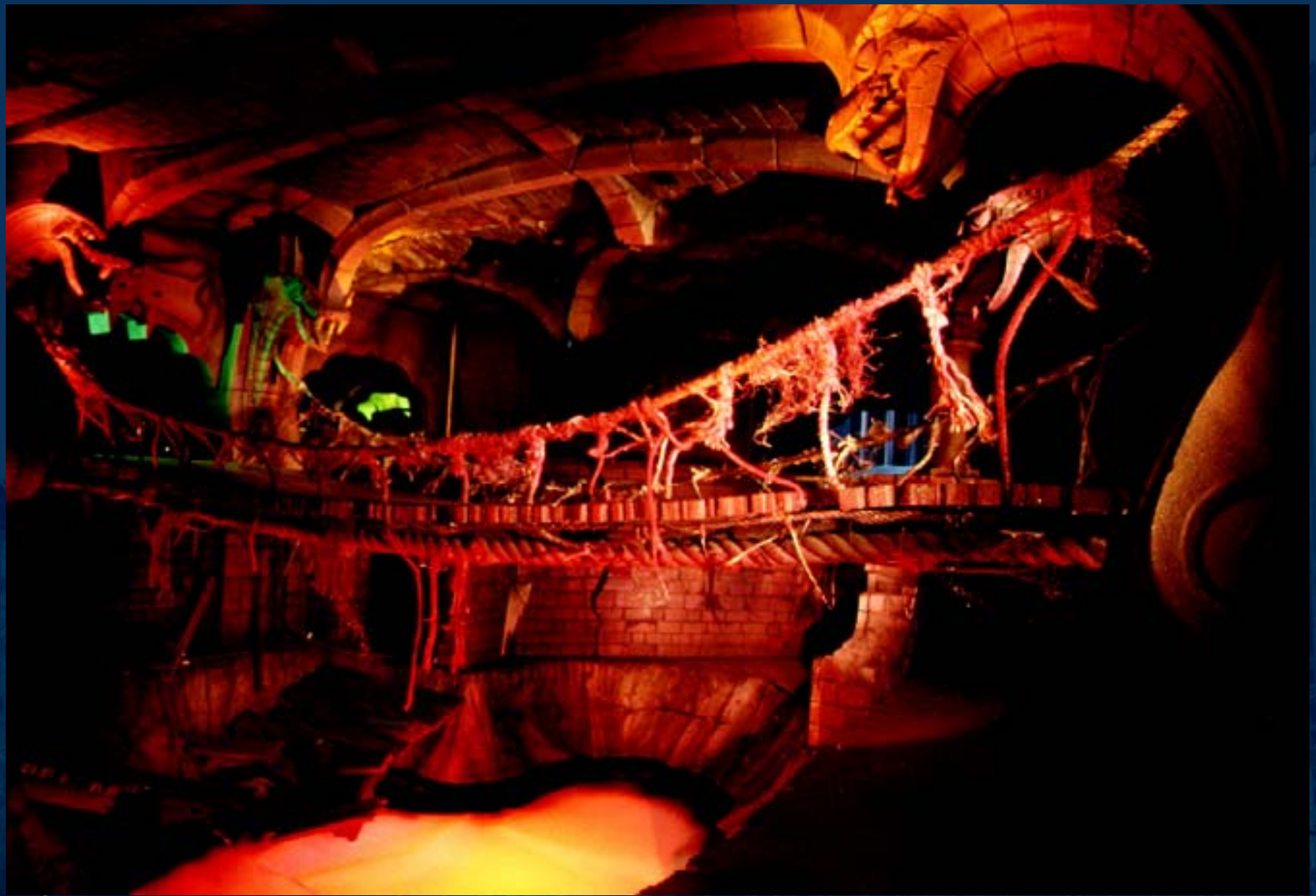
Long tradition of physical model making







Imagineering R&D



Imagineering R&D



Images of design and construction

How does a visually sophisticated organization “think” about and discuss the strategies for the construction process?





Images of design and construction

4D:





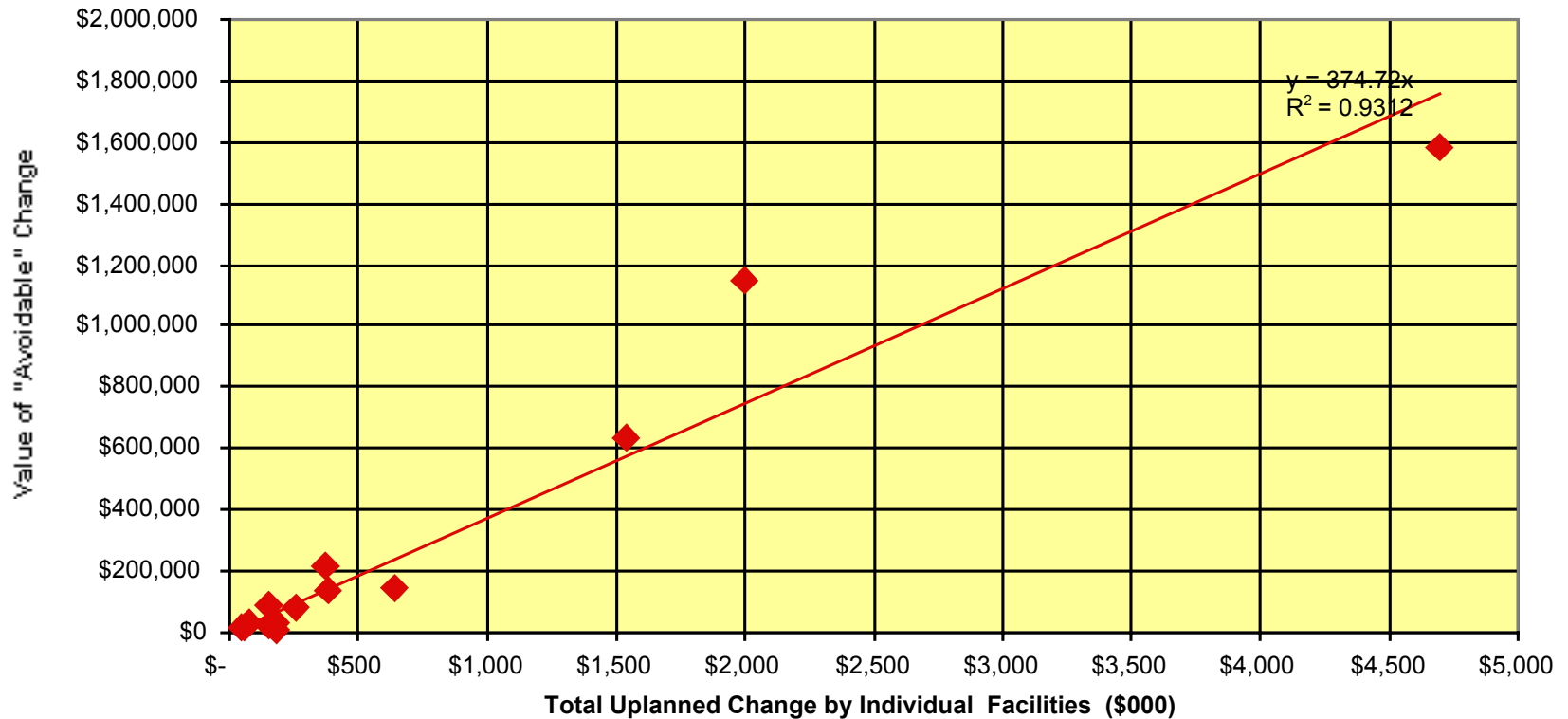
4D Model Benefits

- Communicating with the Owner's CM team
 - bring new members up to date
 - insights into “holes” in schedule
 - Fewer unbudgeted change orders
- Communicating with the GC
 - pre-bid reviews
 - snapshots of critical milestones
- Communicating to Subs
 - GC used subcontractor weekly meetings to resolve key issues



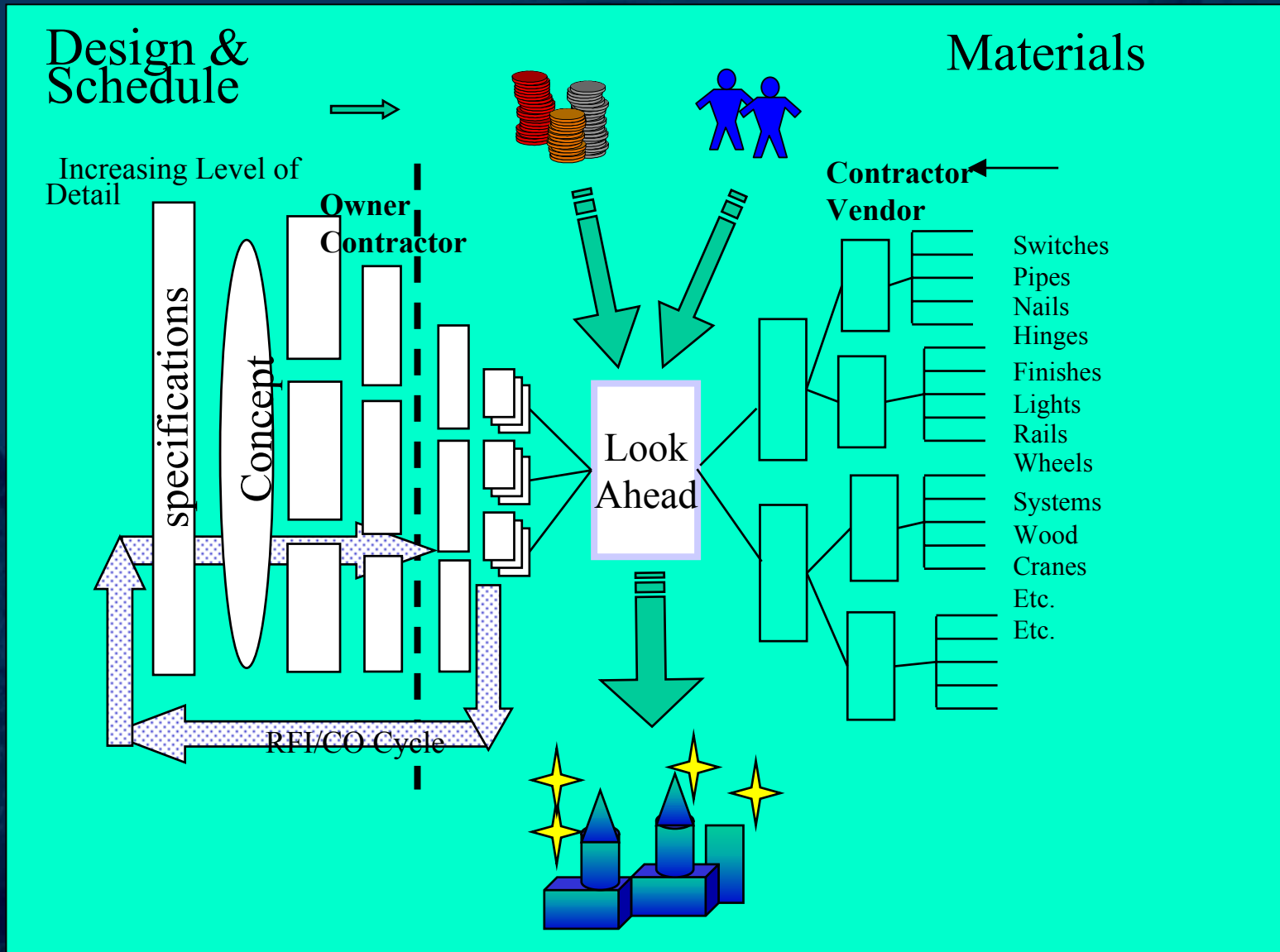


4D Model Benefits: Quantitative Results





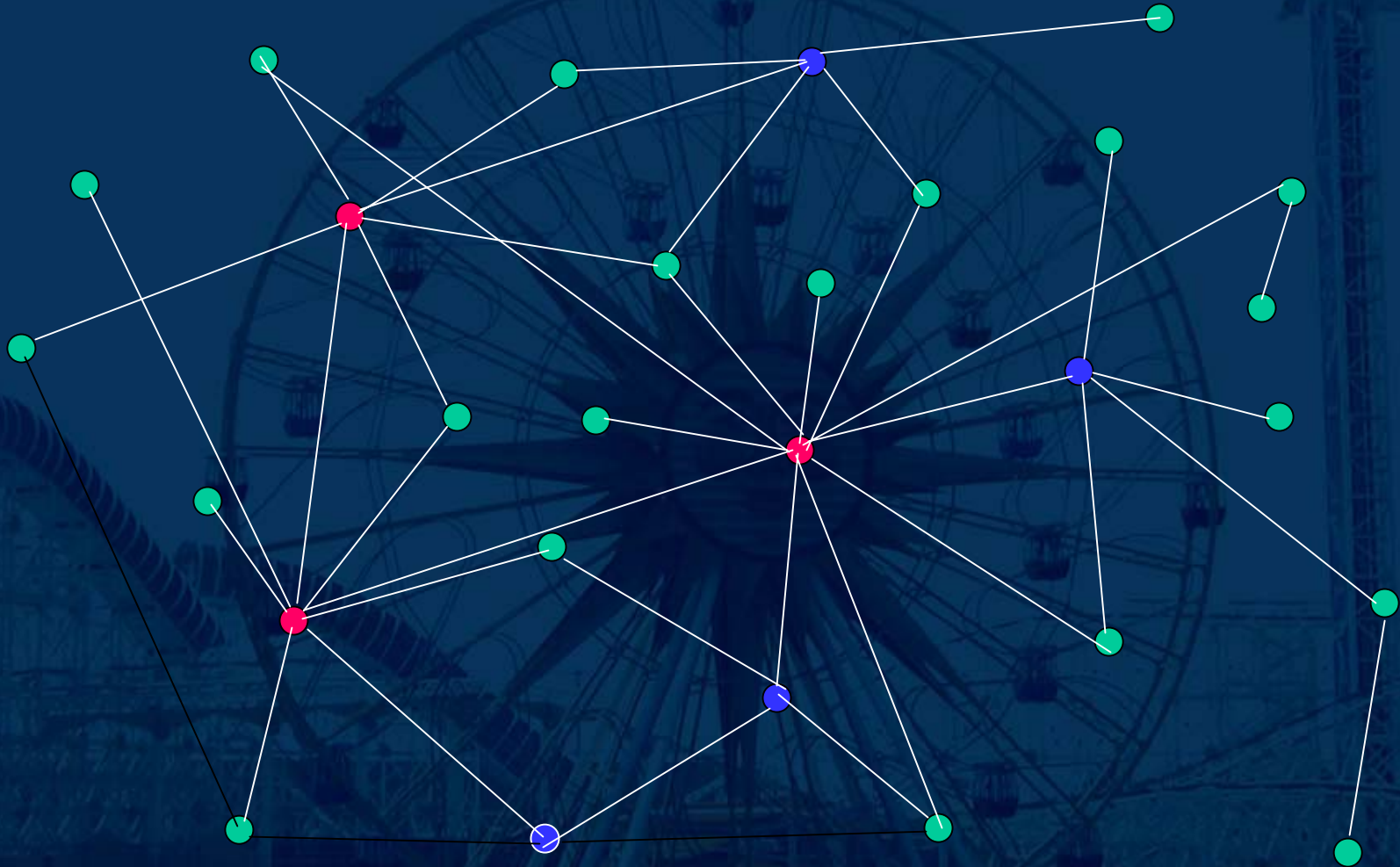
Images of design and construction





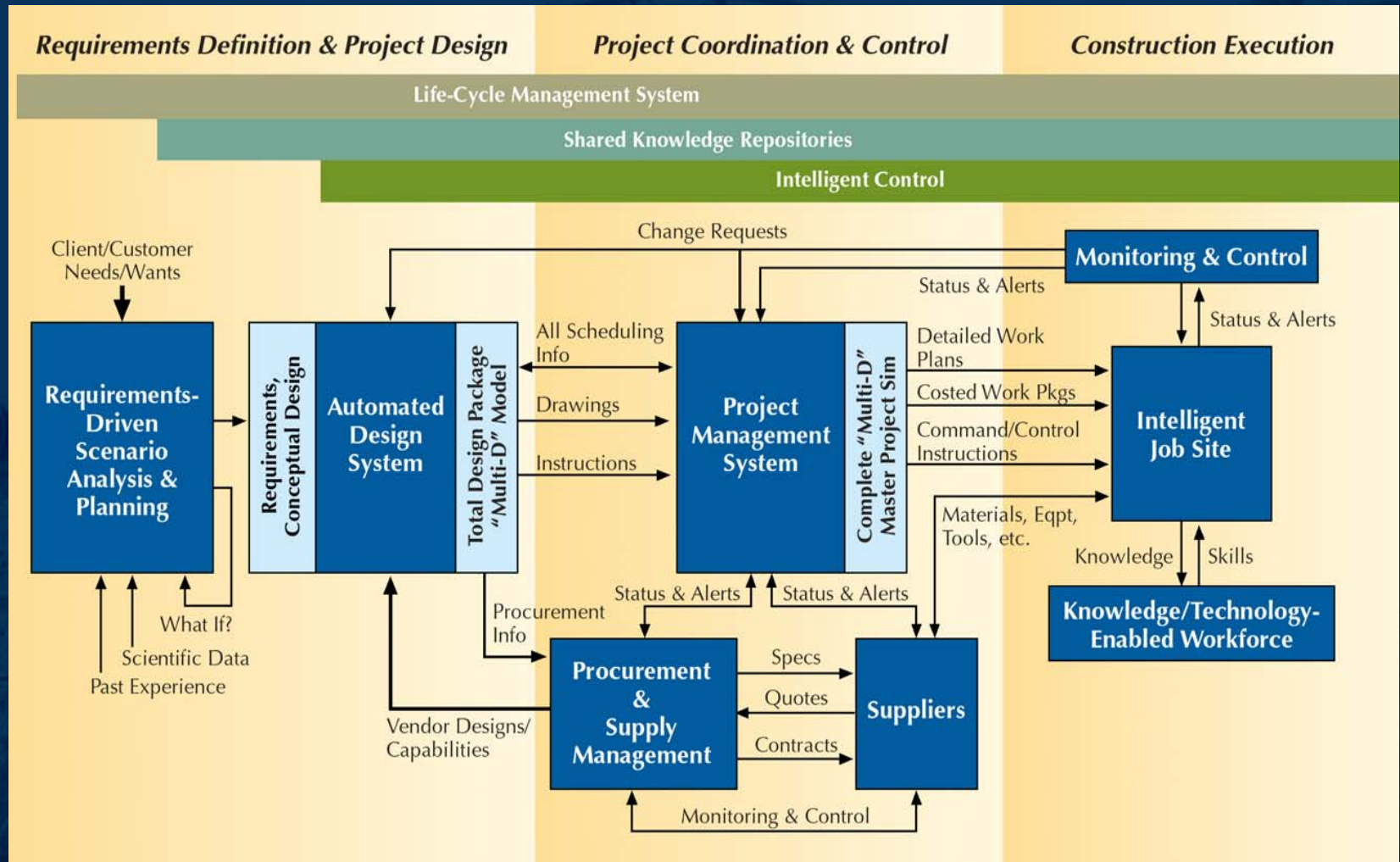


Images of design and construction





Images of design and construction

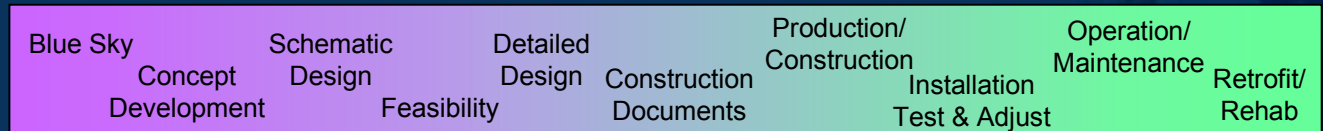




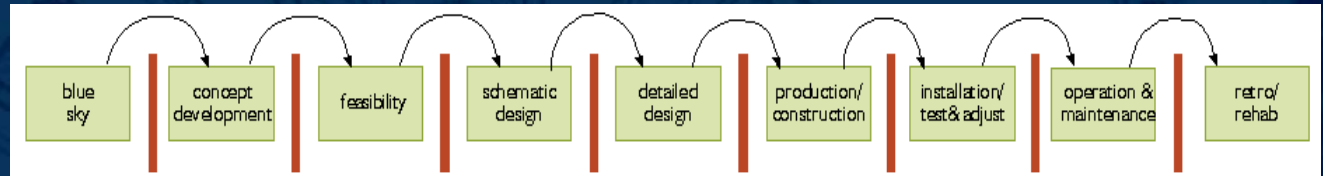
Images of design and construction



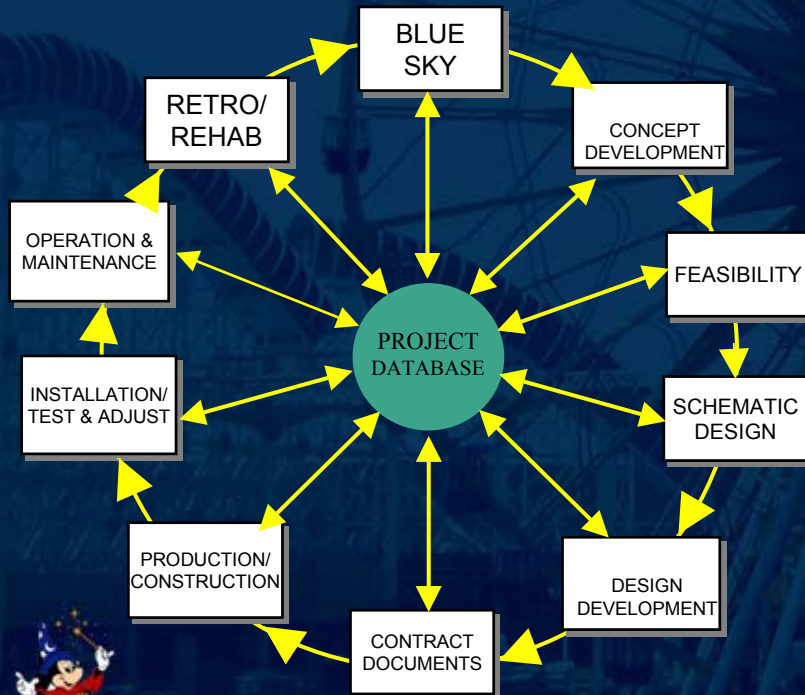
Artisan



Requirements



Tomorrow



Poor control for money, risk



Fixes #1-> but:

- depends on people
- difficult to share data
- doesn't capture why or how



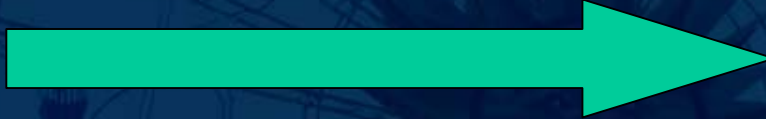
Fixes #2->but ???



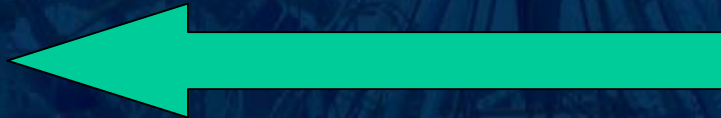


How do you measure value?

Information flows one way

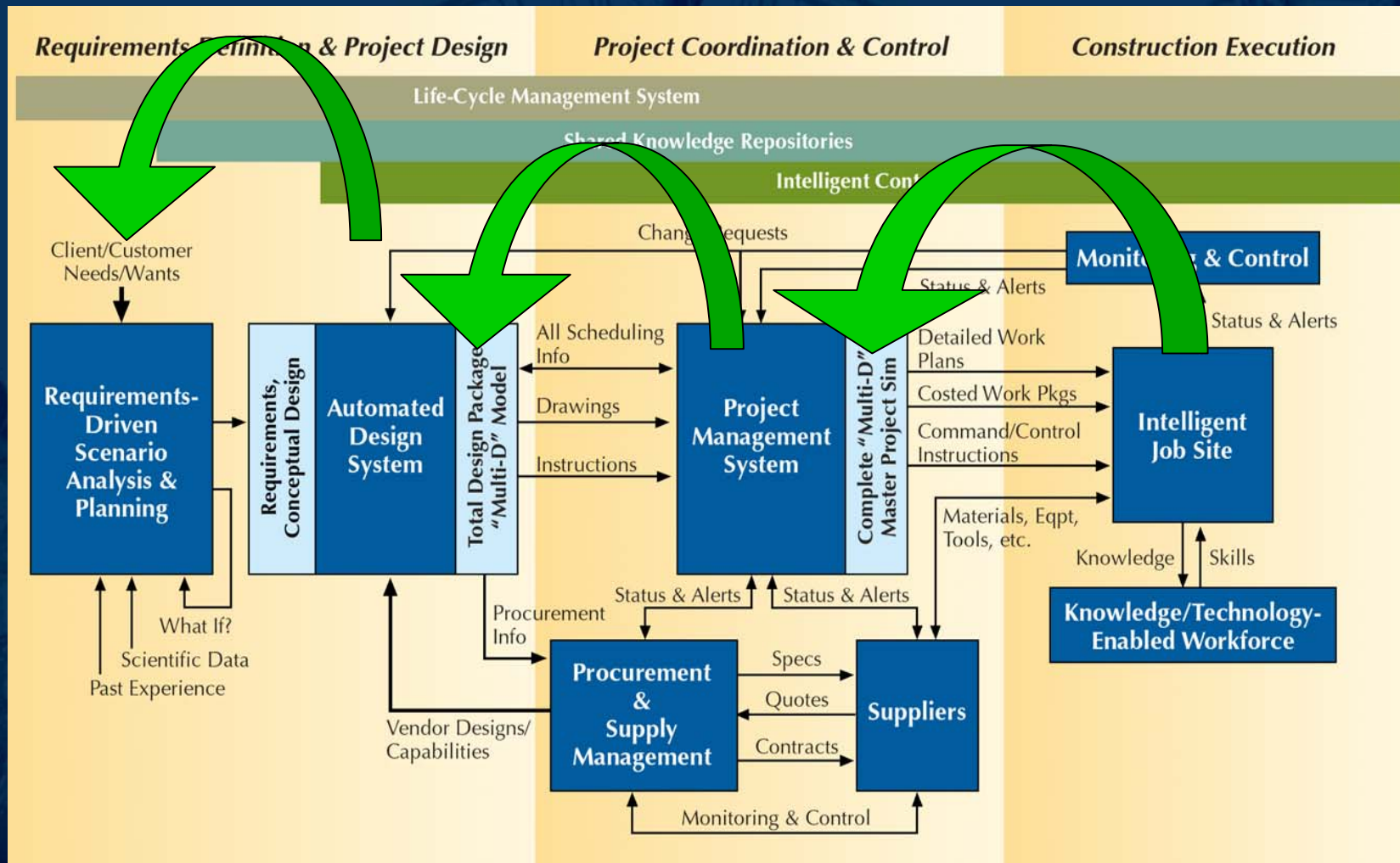


Value should flow the other way



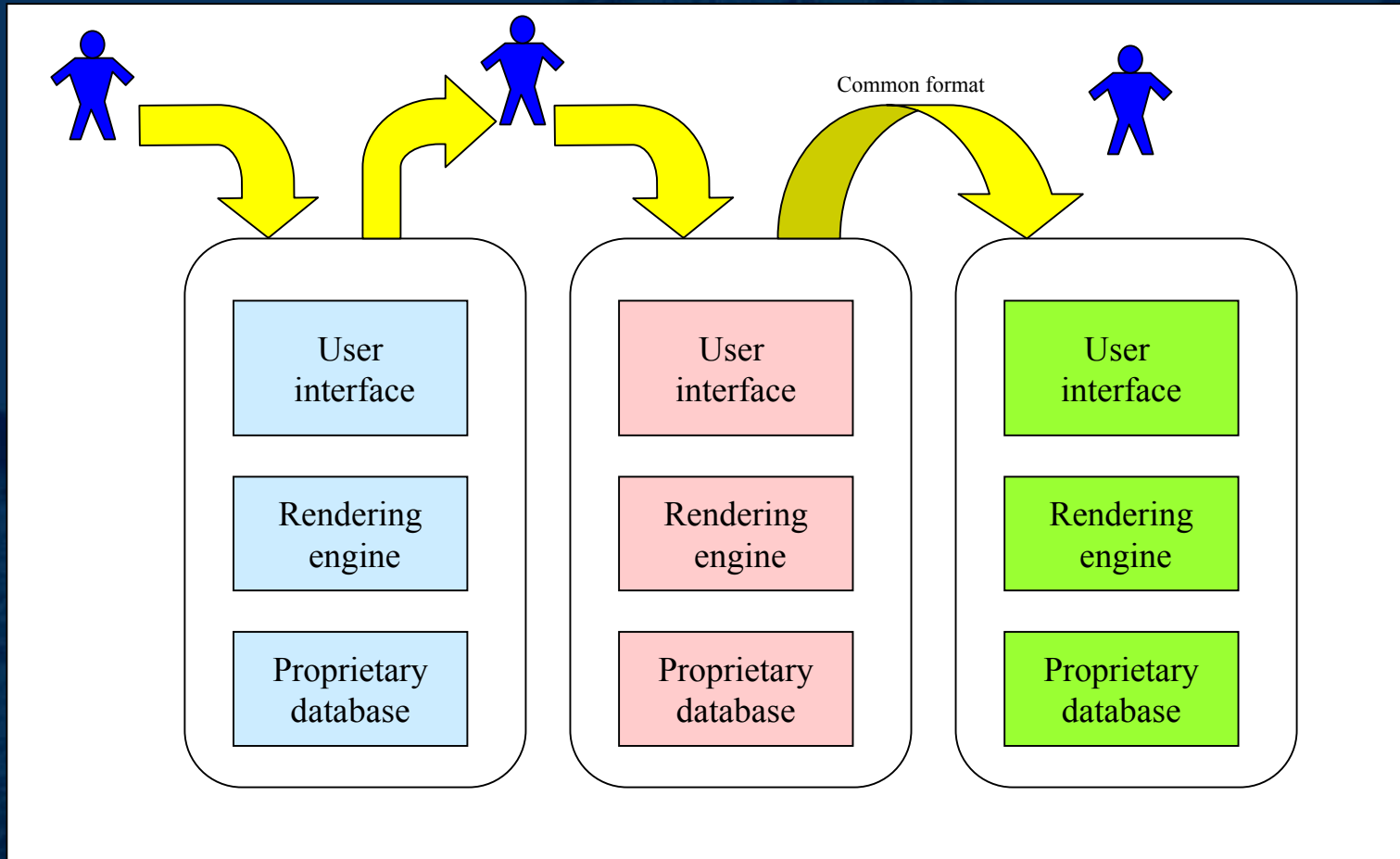


How do you measure value?





How do you measure value?



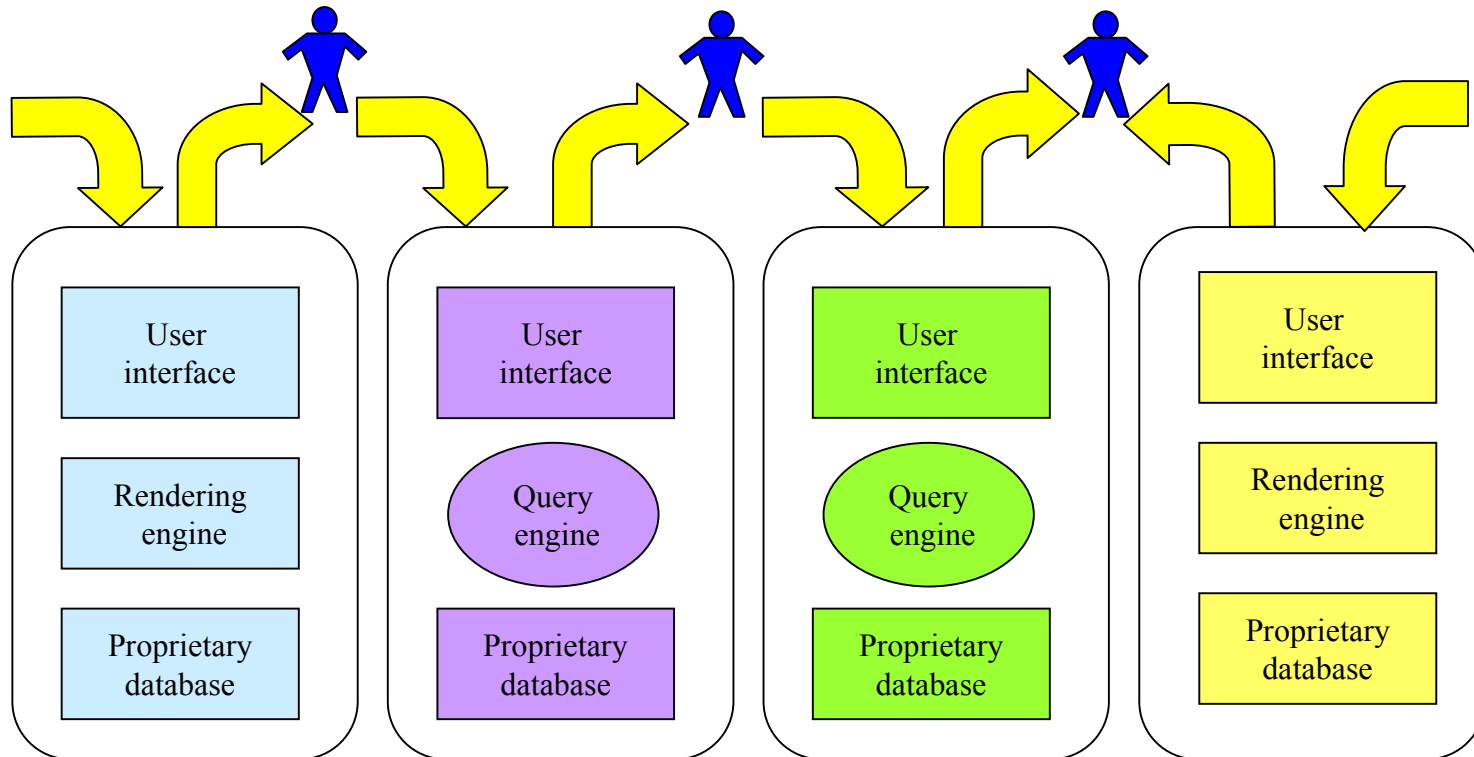
Design Data in our world today. . .e.g. AutoCad®

These tools do not communicate at the database level





How do you measure value?



Project Data in our world today. . .
e.g. AutoCad[®] + SAP[®] + Primavera[®]

These tools do not communicate at the common format level



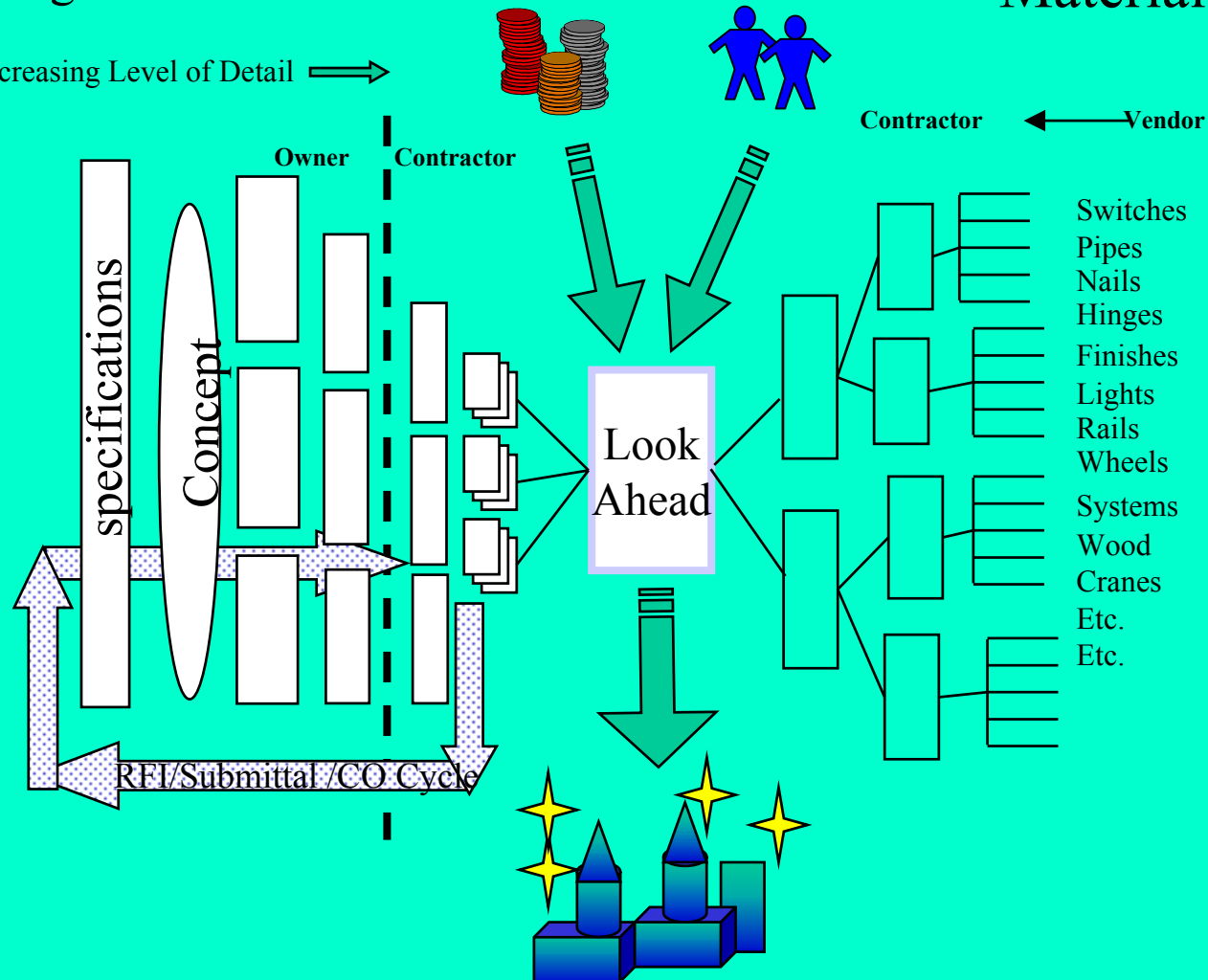


How do you measure value?

Design & Schedule

Materials

Increasing Level of Detail →





Transactional Data Uses

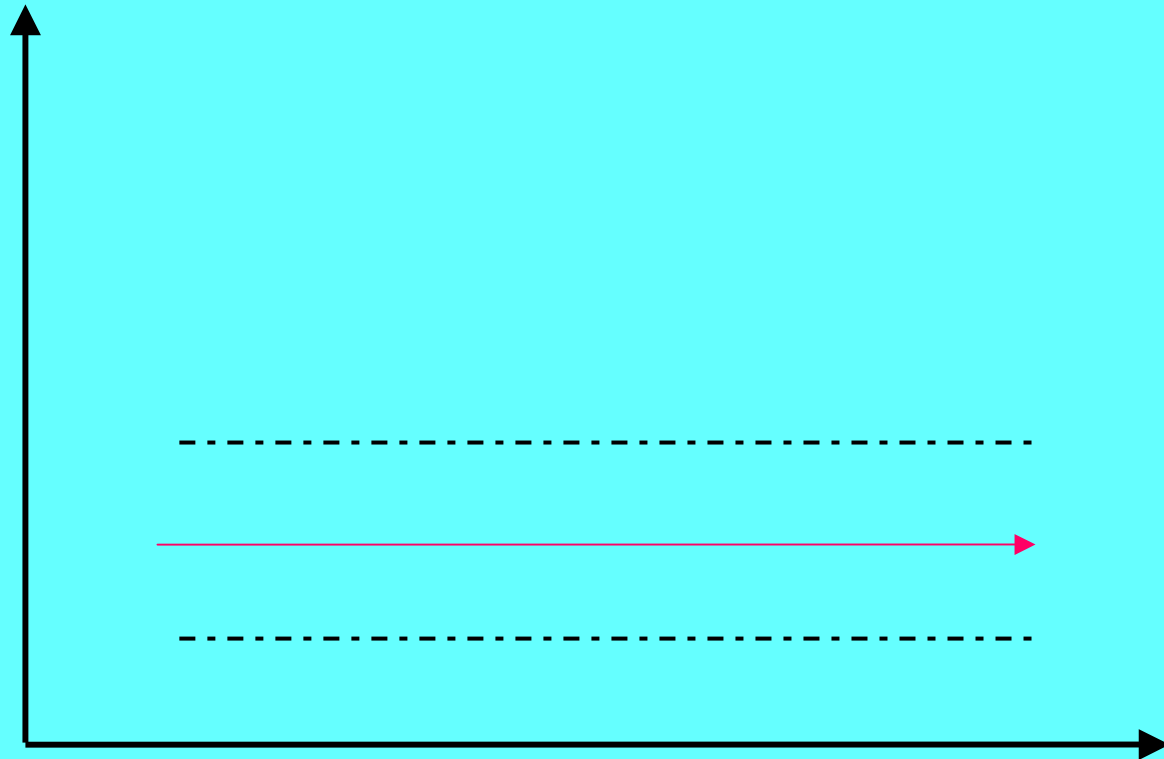
- Data on information changing hands
 - Requests for Information
 - Change directives
 - Shop drawing submittals
 - Deficiency correction notices
- The Time to Respond for each is important
- The Variance in time to respond is important





How do you measure value?

Δt

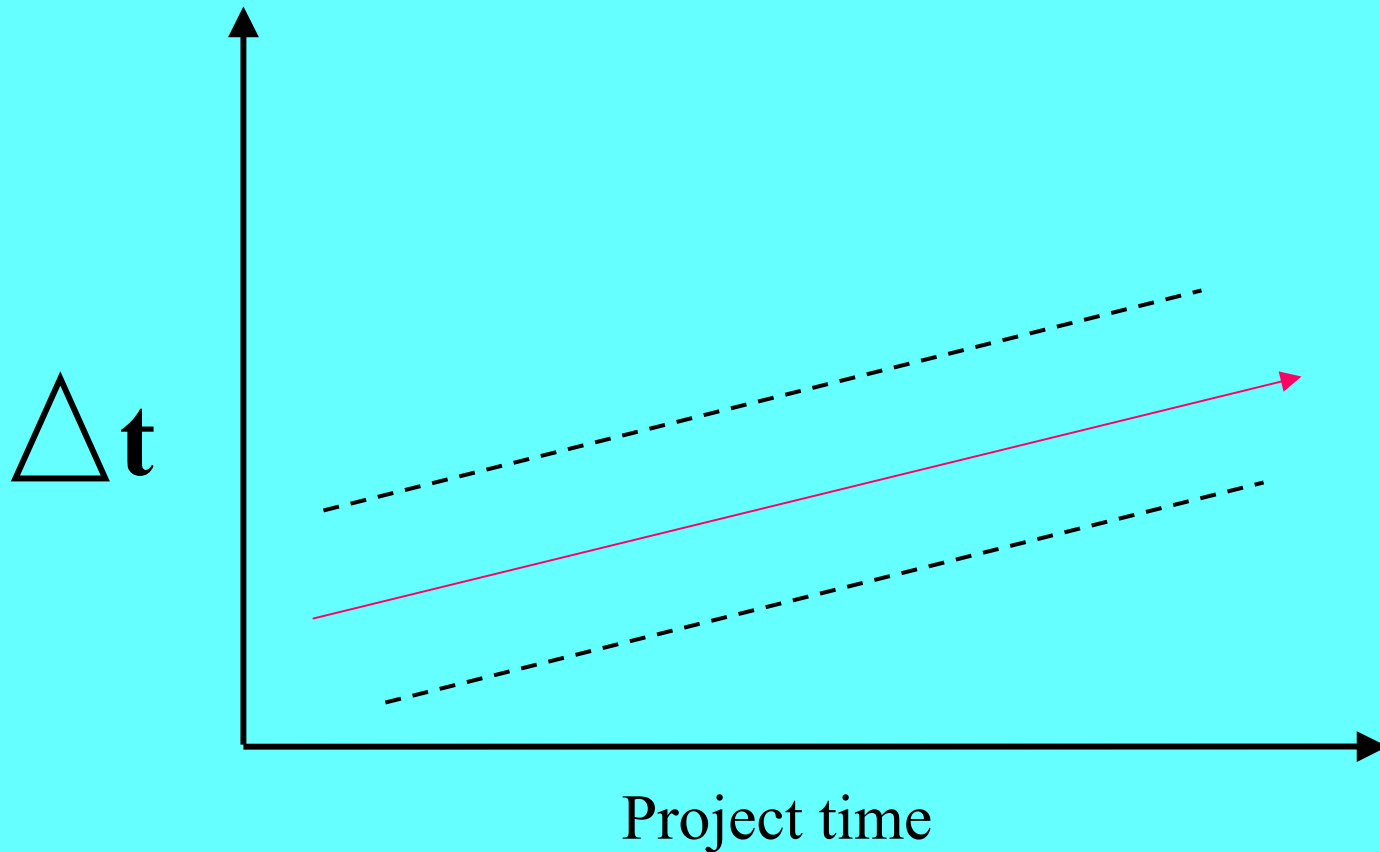


Project time



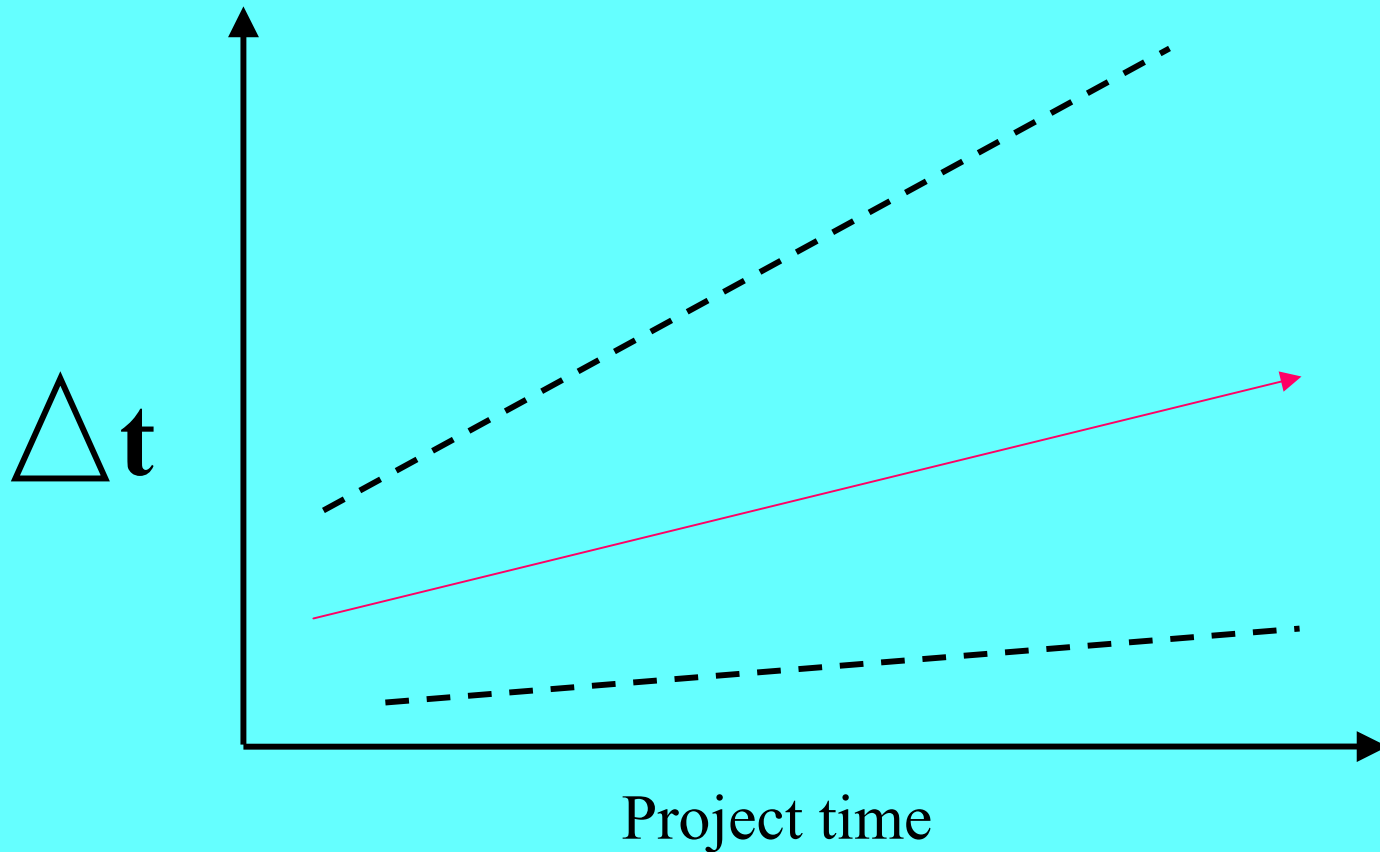


How do you measure value?





How do you measure value?





Changing the AEC Industry?

- Aerospace & auto industry has shown the potential
- Treat Designs as data
- Develop flexible data standards
- Need for parametric design tools
- Manage supply chains
- Measure performance continuously

